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# PAN (Portable Antiquities of the Netherlands): Harnessing Geospatial Technology for the Enrichment of Archaeological Data

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**Abstract**

Artefacts found during archaeological fieldwork are the objects most favoured by academic research. Private collections on the other hand, of which many exist and which may contain large numbers of artefacts, are mostly disregarded. These overlooked objects are often retrieved by people looking for artefacts in agrarian fields or in construction yards. Their private collections carry considerable value for archaeological and heritage research, but have never been systematically documented. They are therefore hardly known within professional circles in the Netherlands. The central aim of PAN (Portable Antiquities of the Netherlands) is to document and publish archaeological finds in private ownership online, particularly metal artefacts found by metal detector users. PAN makes information about these objects and their find locations available for a variety of stakeholders, significantly increasing the amount of archaeological artefacts that can be used for research and for the creation of object distribution maps in the Netherlands, which are an important research tool for archaeologists.

**Keywords:**

archaeology, geospatial technology, the Netherlands, Digital Humanities

## 1 Introduction

Portable Antiquities are small archaeological finds such as fibulae, shards, coins, hairpins etc. Private individuals searching with a metal detector in arable fields or construction yards retrieve thousands of archaeologically relevant finds every year. The scientific potential of these private collections is vast, but unfortunately they have not so far been systematically used in the Netherlands. While distribution maps of portable antiquities are important sources of information for professional archaeologists, such maps are notoriously incomplete due to the lack of a centrally organized database of privately owned items. In addition to their scientific interest, portable antiquities are also highly relevant for heritage management in the context of spatial planning as indicators of archaeological sites. Despite the

importance of these artefacts and their find locations, they have so far never been widely available, due to legal and privacy issues.

The custom-made web application created for PAN makes this possible by catering for the needs of two main groups: specialists wishing to use the database for research, and the general public. The online data portal houses information about portable antiquities, allowing the PAN network of researchers and volunteers to photograph, identify and publish archaeological objects found by metal detectorists. The exact locations of the finds are only available for authorized users; the public version of the site limits the locations of finds to the level of the municipality in order to protect the privacy of the metal detectorists and land owners. In this way, the PAN application makes a large set of data available for many different areas of research and interests.

## 2 Project background

It is no coincidence that the PAN project started in 2016. On 1 July 2016, the new Dutch Heritage Act, in which metal detection is allowed in the top 30 cm of the soil, became law. Up until then, metal detection was illegal in the Netherlands, although it was often practised and not actively prosecuted. Metal-detecting is seen as a threat to heritage by many professional archaeologists, who fear disturbance to archaeological sites and the elimination of valuable contextual information for the finds retrieved. Consequently, animosity between archaeologists and metal detector users is not uncommon in the Netherlands and elsewhere (Lewis, 2016), and it has raised important questions regarding the ownership and management of cultural heritage (Thomas, 2016). This conflict has resulted in a lack of collaboration between the two communities and the uncertain status of objects found by metal detectorists. At the same time, such collections are invaluable for archaeological research. Finding a way to deal with the uncertainty surrounding such finds and incorporating them within distribution maps would greatly change our perception of the past.

One example that illustrates the importance of incorporating detector finds is the difference in the distribution of pseudo-coin brooches recovered during archaeological fieldwork and by private metal detectorists (Figure 1). Published finds form the minority of recovered archaeological objects, and by collating this information with objects from private collections which have been localized a more comprehensive view of the past can be achieved (Heeren & Van der Feijst, 2017, pp. 365–366). Similarly, long-standing ideas concerning the adoption of Roman practices only in urban areas in the Low Countries after the Roman conquest (Van Es, 1981, p. 261) have become less plausible following recent research into various Roman finds in private collections. The distribution of finds such as coins, military gear, jewellery and bodycare utensils recovered by private collectors suggests that the inhabitants of rural settlements were well integrated in the Roman state and its economic structures (Aarts, 2000; Heeren, 2009; Nicolay, 2007). If our current bias, due to the incomplete account of the presence/absence of material remains, is even partially corrected in find distribution maps, the interpretation of archaeological sites and historical phenomena may be enhanced.

The PAN project was set up in order to enable the documentation of artefacts from private collections, facilitating research into distribution patterns of archaeological finds. In accordance with the new Dutch Heritage Act, documentation of private collections of portable antiquities began immediately, on 1 September 2016, because many of these are currently threatened. Collectors who started searching for artefacts in the 1970s, when metal detectors became widely available, are getting older. The value of their collections lies not only in the finds themselves, but also – and mainly – in the locations where the finds were made. The exact find-spot is rarely documented and is often only kept in the finder's memory. This information must be passed orally from the finder to the researcher and plotted on a map, so that it can be combined with professional pictures and descriptions of the artefacts. The PAN project is aimed primarily at the larger collections of the mature collector, so that their valuable collections can be documented.

There are several possible incentives for collectors to participate. Firstly, by letting PAN researchers register their finds, they comply with the requirements of Dutch law to register any find made through metal detection. Allowing PAN registrations to take place at the collector's convenience provides an easier method of complying with this obligation than the alternative - registration at the police station. In addition, some collectors are keen to share their findings with professionals and discuss their historical significance (Deckers et al., 2016). An additional value of the incorporation of archaeological objects in the PAN network is their identification and dating by specialists.

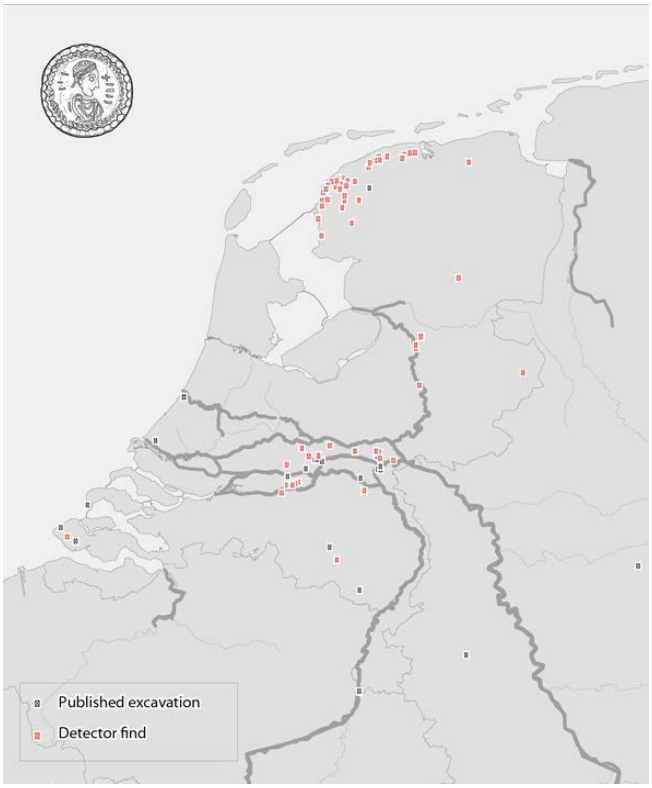


**Figure 1:** The spatial distribution of pseudo-coin brooches and their recovery method. Adapted after Heeren & Van de Feijst, 2017, p. 223, Figure 4.172

## 3 The PAN web application

The online PAN platform (www.portable-antiquities.nl) application comprises three sections designed for public, research and administrative purposes. While the third section contains all recorded finds, only objects validated by specialists can be seen in the public and research sections. All sections were developed with a focus on ease of use for recording, viewing, exploring and exporting information about the finds stored in the system.

Once the database structure for PAN was set, the find registrars could start interviewing the finders who agreed to participate in the programme. The finds are photographed and recorded using the administrative part of the application, which also allows for a polygon to be drawn marking the search area and a point feature for the exact find-spot. In cases where the artefact was retrieved a while ago and it is difficult to pinpoint the exact find location due to landscape changes, it is possible to choose an historic map from any point in the past in order to help locate the find-spot (Figure 2). A menu with an overview of each collection of artefacts, sorted by find locations, is presented for every registered participant. The level of identification for the finders is kept to a minimum, only alias names being necessary. If agreed by the participants, their full names and email addresses may be stored in the database. This form of minimal identification was chosen in order to protect the privacy of collaborators, thereby encouraging them to share their collections.

One of the main aims of the technical realisation of the public section was to create a user-friendly online environment. This would serve the outreach and heritage purposes of the project, which include the encouragement of public engagement in local heritage and the active participation of non-professionals in academic research. This goal was achieved by creating a straightforward webshop-type front end, which provides a clear overview of the dataset and allows the visitor to navigate easily through thousands of stored objects. An overview of finds per municipality is available through an interactive map viewer (Figure 3).

Authorized individuals can access additional aspects of the validated finds, including the exact find-spot. Specific functionalities in this section allow for the export of data, and areas can be selected manually by drawing polygons in order to retrieve records for specific locations (Figure 4).

The PAN application was built with a layered structure. The front end was developed using AngularJS and Bootstrap. In order to visualize the location of the finds on a map, open layers with an OpenTopo basemap were used, and a combination of open data sources: OpenStreetMap, AHN (Actual Height Netherlands), BAG (Basic Registration addresses and buildings) and BRT (Basic Registration Topography). The 'topotijdreis' application (www.topotijdreis.nl) is embedded in the site, which allows a view of the historic cartographic situation during the registration of finds. The back end was created using Java, Spring Framework and PostGIS.


**Figure 2:** By incorporating the 'topotijdreis' application, finders can identify past search areas which are no longer visible in current maps

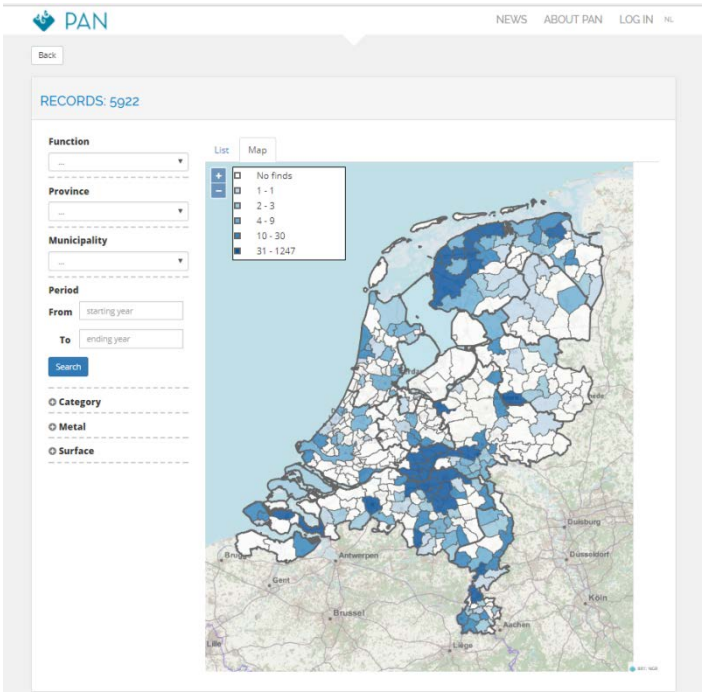


**Figure 3:** An interactive map viewer in the public section of the PAN web application. By clicking on any municipality, visitors can open a list of all artefacts found within its boundaries

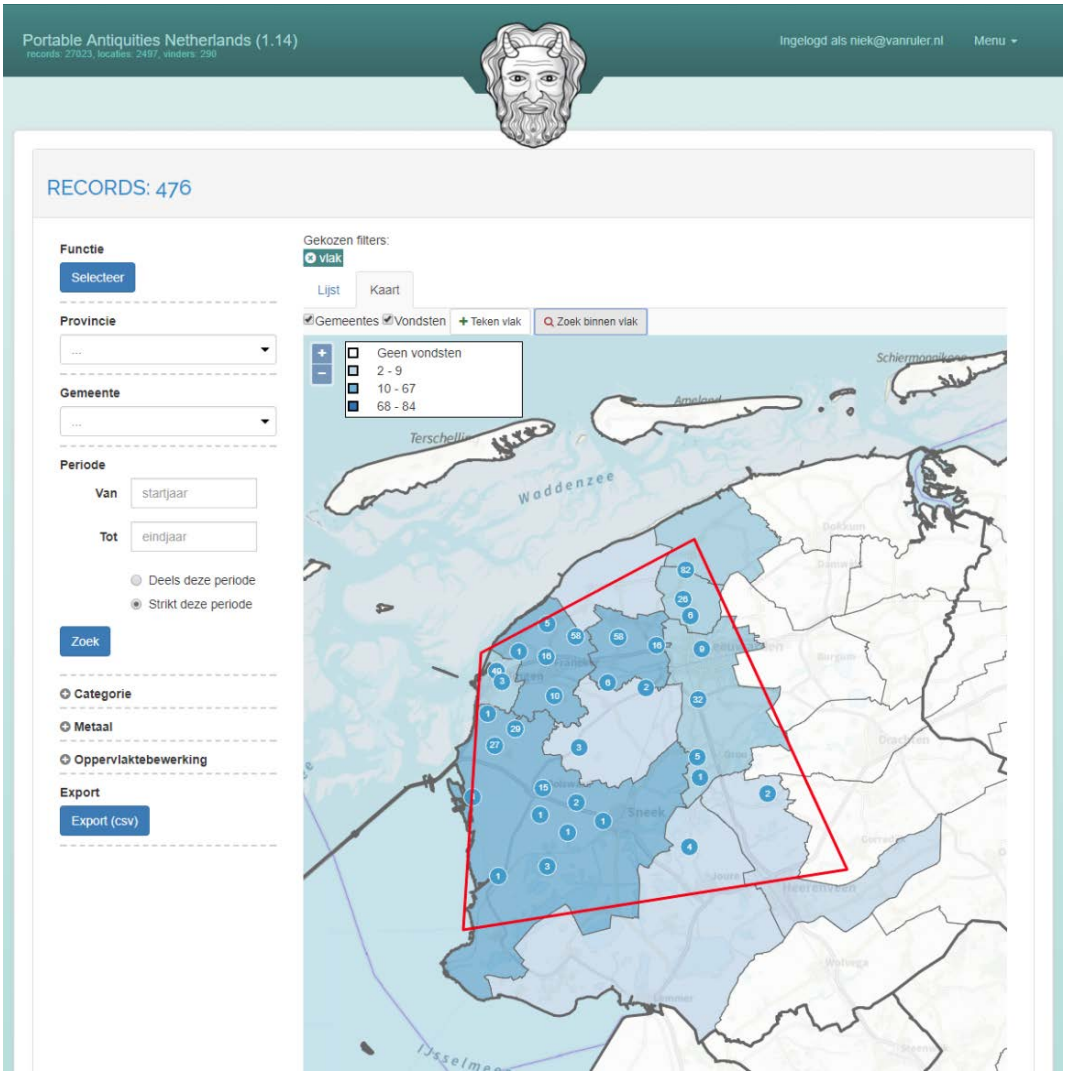


**Figure 4.** Authorized users can make use of the 'export by polygon' tool functionality to export records within a specific area

The PAN data is made accessible through a REST API (Representational State Transfer Application Programming Interface) which allows the front end to communicate with the back end. Some parts of the REST API are publicly accessible, while others containing confidential information (such as the exact find location) are available only for authorized users. Links with three other systems were established:

**NUMIS (Dutch National Bank)**

NUMIS is a database of Dutch numismatic finds. All the fully described coin finds in PAN are exported to NUMIS through an Excel file. Once a month, the Dutch National Bank (DNB) transfers the Excel files with FTP (File Transfer Protocol) to their systems.

**PoolParty**

PoolParty is an AI platform based on semantic technologies and machine learning for the building and management of semantic infrastructures. In PAN, PoolParty is used to provide each find with a reference according to its identification. Once a find is validated, a suitable reference type is recorded in PoolParty. PoolParty has a REST API which enables the details of the related reference type to be retrieved and displayed in PAN.

**DANS (the Netherlands institute for permanent access to digital research resources)**

DANS EASY is a national Dutch archive of research data. All the validated finds are shared with DANS. This is done through a SWORD protocol (Simple Web-service Offering Repository Deposit), an interoperability standard that allows digital repositories to accept the deposit of content from multiple sources in different formats (such as XML documents) via a standardized protocol.

## 4 Last phase of application development and future directions

Roughly 18 months after the first finds were recorded in PAN, the database now (September 2018) contains over 25,000 finds, about 6,000 of which have been published and are available for viewing online. The training of volunteers who will support the documentation of finds and expand the network of PAN registrars started in December 2017. The find export option, linking between objects in the PAN system and external partners, is currently under development. A link to the Dutch coin database, NUMIS, has already been established. This link allows for coin finds to be exported to the DNB, which in turn provides an official identification for them.

The success of PAN lies in its ability to cater to the needs of various stakeholders. By providing a platform for portable antiquities, it brings together metal detector users, archaeologists, policy makers and members of the general public. Finds which were previously unknown are now properly documented and made available. PAN thus enriches archaeological data in the Netherlands, facilitating what was previously unthinkable – adding value to portable antiquities so that they can be used for further research and heritage purposes. PAN also enables us to add a spatial dimension to archaeological finds, which would otherwise stay without a context.

Fortunately, PAN is not alone. Similar digital recording systems for public finds have expanded the research potential of archaeological artefacts at international level, with initiatives in England and Wales, Flanders and Denmark (Deckers et al., 2016, p. 427). One of the next steps in this research programme is to explore international cooperation, in order to connect national datasets housing small archaeological finds. Efforts are being made to

link different national datasets by digital means, so that we can further explore the potential of portable antiquities.

## Acknowledgements

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